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student to have access to original descriptions. No one is able to tell when an apparently useless character (from the systematist's standpoint) and therefore one invariably omitted from keys, may not assume prime importance in the light of unnamed material. The practical difficulty that one has in depending upon literature and concise revisions is this. By testimony of keys (and figures too) one may have a species very close to a named species, yet there may be present in the questionable form additional characters of which no mention is made in keys. If one has not access to the original or some later authentic description he is "up a stump." The writer has so often found himself in this undesirable position that he speaks with some feeling on the subject.

However, the lack of descriptions is partly compensated for by the excellent notes under "Remarks," and in some cases by the republication of figures. Students of the group have every reason to be grateful to Dr. Clark for a very timely and useful memoir, and one which has in several instances reduced to order what was seemingly hopeless chaos.

W. K. Fisher.

LEPIDOPTERA

The Blue Butterflies of the Genus Celastrina.—In the second volume of Mr. J. W. Tutt's "British Butterflies," recently published, is a most exhaustive account of the small blue butterflies represented in Europe by *Celastrina* (vel *Cyaniris*, vel *Lycæna*) *argiolus*, and in America by the common and widely distributed *C. pseudargiolus*. The latter insect has long attracted much attention, owing to its remarkable polymorphism, which has been elucidated very fully by Edwards and Scudder. Mr. Tutt has gone over the whole subject afresh, and with the assistance of Dr. T. A. Chapman and Mr. G. T. Bethune-Baker, has been able to reach a number of very interesting conclusions. It appears that Celastrina is essentially an old world type; found, or represented by close allies, in every one of the great zoological regions of the Eastern Hemisphere, though feebly represented in Australia and Africa. In America, it is represented by *C. pseudargiolus* and its subspecies, one of which extends as far south as Panama. An examination of the structural characters, especially the genitalia, shows that *pseudargiolus* is not in any way definitely separable from the palæarctic *argiolus*, of which it must be considered a geographical race. It appears probable that *C. argiolus* reached America in late Miocene times, and being able to live on a great variety of plants, spread widely, producing various local races. So long as it was restricted to temperate regions, it did not come to differ radically from the old world type; but the form *gozora* Boisduval, of the mountains of Mexico and Central America, is very striking in appearance. Even this last, however, has the genitalia and other structures of genuine *argiolus*. This case is especially instructive, because it indicates that an insect may spread very widely, invading regions with exceedingly diverse climates, and yet not change materially in the characters of the genitalic armature. When we remember how frequently allied species of insects, inhabiting the same or similar regions, are separable by genitalic characters, it seems that these are little or not at all connected with obvious environmental factors. To say that genitalic modifications are due to "mutation" does not really explain them; it remains to be shown, if that is possible, what it is that breaks down an established genitalic type, giving rise to new forms which rank as species. In the case of *Celastrina*, it is not to be assumed that its structural features are so immobile that they are incapable of modification. As a matter of fact, the numerous old world species are distinguished by the possession of very distinct genitalia, each very constant within specific limits. In Asia there are very distinct races, having precisely the structure of *C. argiolus*, and at the same time species exceedingly like *argiolus* superficially, but quite different in their genitalic appendages. From the standpoint of the natural selectionist, it may be remarked that there was nothing to be gained by genitalic differentiation in America, so long as only one species of Celastrina inhabited the country; and further, that the range of the insect, with all its local modifications, was practically continuous. It may be that in Asia (especially among the islands) distinct species arose, adapted to special food-plants and other conditions, and that whenever these spread so that their ranges overlapped, crossing—by throwing the organism out of gear with its environment—was injurious, and so tendencies to genitalic modification were preserved. If these arose by simultaneous mutation,[1] not by random scattering variation, they might in such a case lead to a pure differentiated race. Suggestions of this sort are of course to be taken with an adequate supply of salt, but they have their use as stimulating enquiry.

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[1] Or, perhaps, were already present as Mendelian recessives?

Some years ago, in an address before the Entomological Society of London, Professor Poulton raised the question whether the ability to mate successfully was not after all something maintained by rigid natural selection; and if I remember his argument correctly (I do not possess a copy of his paper), he believed that differences in the sexual organs might be expected to arise whenever selection ceased to operate. Since that time Tower has produced striking evidence of the small amount of divergence which suffices to throw an organism (in his instances beetles) out of the race. In this connection it may also be remarked that the singular fertility between different races of men, dogs, cattle, etc.,—many of these differing exceedingly in many characters of color and form—may be attributed to the effects of natural selection. The purest breeds of dogs, and no doubt the best established races of men, are after all great mongrels; and in the course of time no doubt interracial infertility would be absolutely discriminated against. However active the imagination may be in picturing causes and effects, it can but pause before such cases of genitalic modification as are described by Dr. J. B. Smith in his revision of the moths of the genus Homoptera and its immediate allies, just published by the U. S. National Museum. In some of these moths the sexual organs are extremely asymmetrical. "In the males the asymmetry is between the harpes of the two sides, which in extreme cases are totally dissimilar, with processes on one side for which there is no counterpart on the other, and which are rarely entirely alike. The sheath of the penis or intromittent organ is always more or less curved or bent, or even hooked, and this structure is directly correlated to the differences found in the female." These peculiarities are all figured most carefully.

T. D. A. COCKERELL.

VERTEBRATE PALEONTOLOGY

The Lysorophidæ.—In 1875 Dr. J. C. Winslow, of Danville, Illinois, a local collector of fossils, discovered, at "Horseshoe Bend," on Salt Fork, on the Tate farm, some two miles south of Oakwood, in Vermilion County, Illinois, some bones which he sent to Professor Cope for identification. Later on the work of exploration at this place was taken up by Mr. W. F. E. Gurley and his collection was transferred to the University of